UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/085,866	02/27/2002	Zhizhang (John) Chen	10013802 -1	1660

7590 04/02/2004

HEWLETT-PACKARD COMPANY
Intellectual Property Administration
P.O. Box 272400
Fort Collins, CO 80527-2400

EXAMINER	
HU, SHOUXIANG	

ART UNIT	PAPER NUMBER
2811	

DATE MAILED: 04/02/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/085,866	CHEN ET AL.	
	Examiner	Art Unit	
	Shouxiang Hu	2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 January 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-30* is/are pending in the application.

4a) Of the above claim(s) *1-12 and 20-30* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☐ Claim(s) _____ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *1/22/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Claims 1-12 and 20-22 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in Paper No. 7.

Claim Objections

2. Claims 13-19 are objected to because of the following informalities and/or defects:

Claim 13 recites the subject matter that the emission layer in the recited electron emitter is formed of a SiO2 and/or SiON. However, according the specification and the drawings (see Fig. 1) of the instant disclosure, the real electron emission layer is the N++ substrate layer (16); while the RTP layer (14) is an insulator which only functions as a tunneling dielectric for the electrons emitted from the electron-supply substrate (16).

Appropriate correction is required.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 18 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claim 18 recites the subject matters that the recited emission layer is formed through a rapid thermal formation process; however, a rapid thermal process (RTP) normally refers to a non-equilibrium thermal process with a substantially high change rate in temperature during the heating up, and the disclosure lacks an adequate description or reference regarding how the recited SiO2 material and the recited SiOxNy material can be both formed during the same RTP, especially regarding the range(s) and/or example(s) of the temperature, the temperature ramping rates, and the gas compositions and pressures, for each of the recited formations of the recited two layers. These parameters are believed to be important to the formation and quality of each of the two layers, given that their thickness is very thin and that the claimed invention is directed to a method for forming such layers.

Furthermore, claim 13 recites the limitation of "a rapid thermal formation process", but the disclosure lacks an adequate and clear description or reference regarding the intended range(s) and/or example(s) of the temperature, the temperature ramping (up and/or down) rates and the gas compositions and pressures applied to the formation of the recited emission layer during the recited rapid thermal formation process. These parameters are believed to be important to the formation and quality of

the "emission layer", given that its thickness is very thin and that the claimed invention is directed to a method for forming such a layer.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 13, 18 and 19, insofar as being in compliance with 35 U.S.C. 112, are rejected under 35 U.S.C. 103(a) as being unpatentable over JP'986 (JP 2000-76986, 3/2000) in view of Wawer (US 2002/0102799) and/or Su (US 2002/0177276).

JP'986 discloses a method for forming an emitter (see Figs. 1a-2), comprising the steps of: forming a patterned oxide layer (2) to define an emission area upon an electron supply layer (1); forming an "emission layer" (SiO2; a tunneling dielectric layer) within the emission area with a thermal formation process; and forming a thin metal layer (3).

Although JP'986 does not expressly disclose that the thermal formation process for the tunneling dielectric layer can be a rapid one, one of ordinary skill in the art would readily recognize that a rapid thermal (oxidation) formation process is a desirable for achieving high quality and low thermal budget for the tunneling dielectric layer, as evidenced in the Wawer (see the tunneling layer 2 in Fig. 4A, also see Paragraph 0039) and/or Su (see the abstract).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to in corporate the rapid thermal formation process of Wawer and/or Su for a tunneling layer into the method of JP'986, so that a method for forming a tunneling layer (or, the "emission layer") with good quality and low thermal budget would be obtained.

Regarding claim 18, it is noted that the "emission layer" (12a) in JP'986 can have a thickness in the range of 50 to 200 Angstroms (see the attached machine translation as a reference in English), which can be regarded as being formed of a lower portion of SiO2 with a thickness of about 20 Angstroms and an upper portion of SiO2 with a thickness of about 30-130Angstroms; and the upper portion of SiO2 therein can be readable as a SiOxNy with y=0.

Regarding claim 19, US'080 further teaches the method of forming the emission layer can be performed as part of an integrated circuit formation process to form the emitter as part of an integrated circuit (See Fig. 18) that naturally includes an emitter control circuitry (at least the interconnections to the individual emitters 10).

7. Claims 14-17, insofar as being in compliance with 35 U.S.C. 112, are rejected under 35 U.S.C. 103(a) as being unpatentable over JP'986 in view of Wawer and/or Su, as applied to claims 13, 18 and 19 above, and further in view of US'417 (US 5,760,417).

The disclosures of JP'986, Wawer and Su are discussed as applied to claims 13, 18 and 19 above.

Although JP'986, Waver and/or Su do not expressly disclose that the method can further comprises a step of forming a metal contact structure, one of ordinary skill in the art would readily recognize that a metal contact structure can be preferably formed for improving the contact to the top thin metal layer, as evidenced in US'417 (see the metal contact structure 807 and the top thin metal layer 808 in Fig. 8).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to in corporate the metal contact structure of US'417 into the above method collectively taught by of JP'986 in view of Wawer and/or Su, so that a method for forming an emission layer with improved contact to the top thin metal layer would be obtained.

Regarding claim 17, the method of claim 14, the metal contact structure (807) of US'417 can be regarded as being comprises multiple metal layers corresponding to the bottom portion, the top portion and other portions of the metal contact structure.

Response to Arguments

8. Applicant's arguments with respect to claims 13-19 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shouxiang Hu whose telephone number is 571-272-

1654. The examiner can normally be reached on Monday through Thursday, 7:30 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on 571-272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SH
March 25, 2004

SHOUXIANG HU
PRIMARY EXAMINER